REMARKS

35 U.S.C. § 102 & § 103 Rejections

The Examiner stated that the pending claims are still under the scope of previous rejections and that the same rationales recited in paragraphs 6 - 13 of the Office Action dated October 22, 2003 still apply.

The Examiner has rejected claims 1 - 20 under 35 U.S.C. § 102(e) as being anticipated by Nguyen.

Claim 1 has been amended to include a solder material and a plurality of thermally conductive particles. Specifically, claim 1 includes the limitations "a solder material having a melting temperature approximately between 100 and 250°C" and "a plurality of thermally conductive non-fusible particles, the solder material interconnecting the non-fusible particles."

Nguyen does not disclose a solder material and a plurality of thermally conductive particles. Nguyen discloses an interface material composition which comprises a rubber, such as a hydrocarbon rubber, phase change material, such as paraffin waxes or polymer waxes, and at least one thermally conductive filler (col. 2, lines 11-14). Thermal filler particles dispersed in the phase change mixture preferably have a high thermal conductivity (col. 4, lines 4-6). Suitable thermal materials include silver, aluminum, copper and alloys thereof, boron nitride, aluminum nitride, silver-coated copper, silver-coated aluminum, carbon fiber, metal-coated carbon fiber such as nickel-coated fiber, boron nitride in amounts of at least 20% by weight, and silver, copper, or aluminum in amounts of at least 50% by weight (col. 4, lines 6-12). All of the

thermal filler particles disclosed in Nguyen have melting points above 250°C, and Nguyen makes no mention of including a solder along with thermally conductive particles in an interface material. Specifically, Nguyen does not disclose a solder material and a plurality of thermally conductive particles.

Therefore, claim 1 is not anticipated by Nguyen because claim 1 includes a limitation not disclosed in Nguyen.

Claims 2-4, 6-14, 16, and 17 are dependent on claim 1 and should be allowable for the same reasons as claim 1 stated above.

Claims 5, 18-20, and 29 have been cancelled.

Applicant, accordingly, respectfully requests withdrawal of the rejections of claims 1-20 under 35 U.S.C. § 102(e) as being anticipated by Nguyen.

The Examiner has rejected claims 1-14, 16-20, and 29 under 35 U.S.C. § 102(b) as being anticipated by Salyer.

Claim 1 has been amended to include a solder material and a plurality of thermally conductive particles. Specifically, claim 1 includes the limitations "a solder material having a melting temperature approximately between 100 and 250°C" and "a plurality of thermally conductive non-fusible particles."

Salyer does not disclose a solder material and a plurality of thermally conductive particles. Salyer discloses a composite useful in thermal energy storage formed from cross linked polyethylene having a straight chain alkyl hydrocarbon incorporated therein as a phase change material (col. 2, lines 29-33). No mention is made of a thermal

interface material with a solder material and thermally conductive particles. Specifically, Salyer does not disclose a solder material and a plurality of thermally conductive particles.

Therefore, claim 1 is not anticipated by Salyer because claim 1 includes a limitation that is not disclosed in Salyer.

Claims 2-4, 6-14, 16, and 17 are dependent on claim 1 and should be allowable for the same reasons as claim 1 stated above.

Claims 5, 18-20, and 29 have been cancelled.

Applicant, accordingly, respectfully requests withdrawal of the rejections of claims 1-4, 6-14, 16, and 17 under 35 U.S.C. § 102(b) as being anticipated by Salyer.

The Examiner has rejected claims 5-14, 16, and 19 under 35 U.S.C. § 103(a) as being unpatentable over Salyer in view of Nguyen.

Claims 5 and 19 have been cancelled.

Claims 6-14 and 16 are dependent on claim 1 and should be allowable for the same reasons as claim 1 stated above.

Applicant, accordingly, respectfully requests withdrawal of the rejections of claims 6-14 and 16 under 35 U.S.C. § 103(a) as being unpatentable over Salyer in view of Nguyen.

Claim 1 has been amended to include a solder material and a plurality of thermally conductive particles. Specifically, claim 1 includes the limitations "a solder

material having a melting temperature approximately between 100 and 250°C" and "a plurality of thermally conductive non-fusible particles."

As previously discussed, Nguyen and Salyer do not disclose a solder material and a plurality of thermally conductive particles.

Nelson does not disclose a solder material and a plurality of thermally conductive particles. Nelson discloses a thermally and electrically conductive adhesive material comprising a hardened adhesive and a non-solidified filler containing a liquid metal dispersed in separate spaced regions of the adhesive (Abstract). As illustrated in Figure 2, a filler containing a liquid metal is provided, which is dispersed into an unhardened adhesive (col. 5, lines 41-43). Liquid metal is the key component of the adhesive material due to its excellent thermal and electrical conductivity as well as its liquidity (col. 5, lines 45-48). As used herein, the term "liquid metal" is defined as being gallium, mercury, or a compound containing gallium or mercury (col. 5, lines 48-50). That is, the "liquid metals" of the present invention are a class of materials which remain so named even if cooled and solidified (col. 5, lines 50-53). Such materials are not solders. Nelson makes no mention of a thermal interfaced material having a solder material and a plurality of thermally conductive particles. Thermally conductive adhesives with dispersed solids have been devised for heat sink attachments of electrical components and for attachment of integrated circuit chips to substrates and other packaging structures (col. 1, lines 47-51). For instance, silver filled epoxies for electrical and thermal interface connections are well known. Although the basic theory of this method appears sound, in practice this method may have serious drawbacks (col.

1, lines 51-56). Since the thermal conductivity of such adhesives depends on the ability of the solids within the adhesives to contact each other and the surfaces to be joined, limited contact areas introduce constriction resistance and reduce the thermal conductance of the joint (col. 1, lines 52-61). Furthermore, there has been some recent activity directed towards overcoming this primary shortcoming with the use of low temperature solder fillers (col. 1, lines 64-67). Although rendering solder fillers molten provides better surface contact than, say, silver filled epoxies, significant drawbacks arise, particularly after resolidification (col. 2, lines 33-36). Solders appear to require heating well above their melting point to wet the surfaces being joined, require flux unless the surfaces are reduced immediately prior to bonding, lack physical compliance, are prone to deformation and fatigue, and are unable to wet most materials besides metals (col. 2, lines 36-41). Therefore, not only does Nelson fail to disclose the use of a solder material and a plurality of thermally conductive particles, but Nelson teaches a way from using either a solder material or a plurality of thermally conductive particles in a thermal interface material. Specifically, Nelson does not disclose and actually teaches away from a solder material and a plurality of thermally conductive particles.

Therefore, claim 1 is patentable over Nguyen, Salyer, and Nelson because claim 1 includes limitations that are not disclosed in nor taught or suggested by Nguyen, Salyer, and Nelson.

Claims 2-4, 6-14, 16, and 17 are dependent on claim 1 and should be allowable for the same reasons as claim 1 stated above.

Applicant respectfully submits that the present application is in condition for allowance. If the Examiner believes a telephone conference would expedite or assist in the allowance of the present application, the Examiner is invited to call Michael A. Bernadicou at (408) 720-8300.

Pursuant to 37 C.F.R. 1.136(a)(3), applicant(s) hereby request and authorize the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 C.F.R. 1.16 and 1.17, to Deposit Account No. 02-2666.

Respectfully submitted,

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